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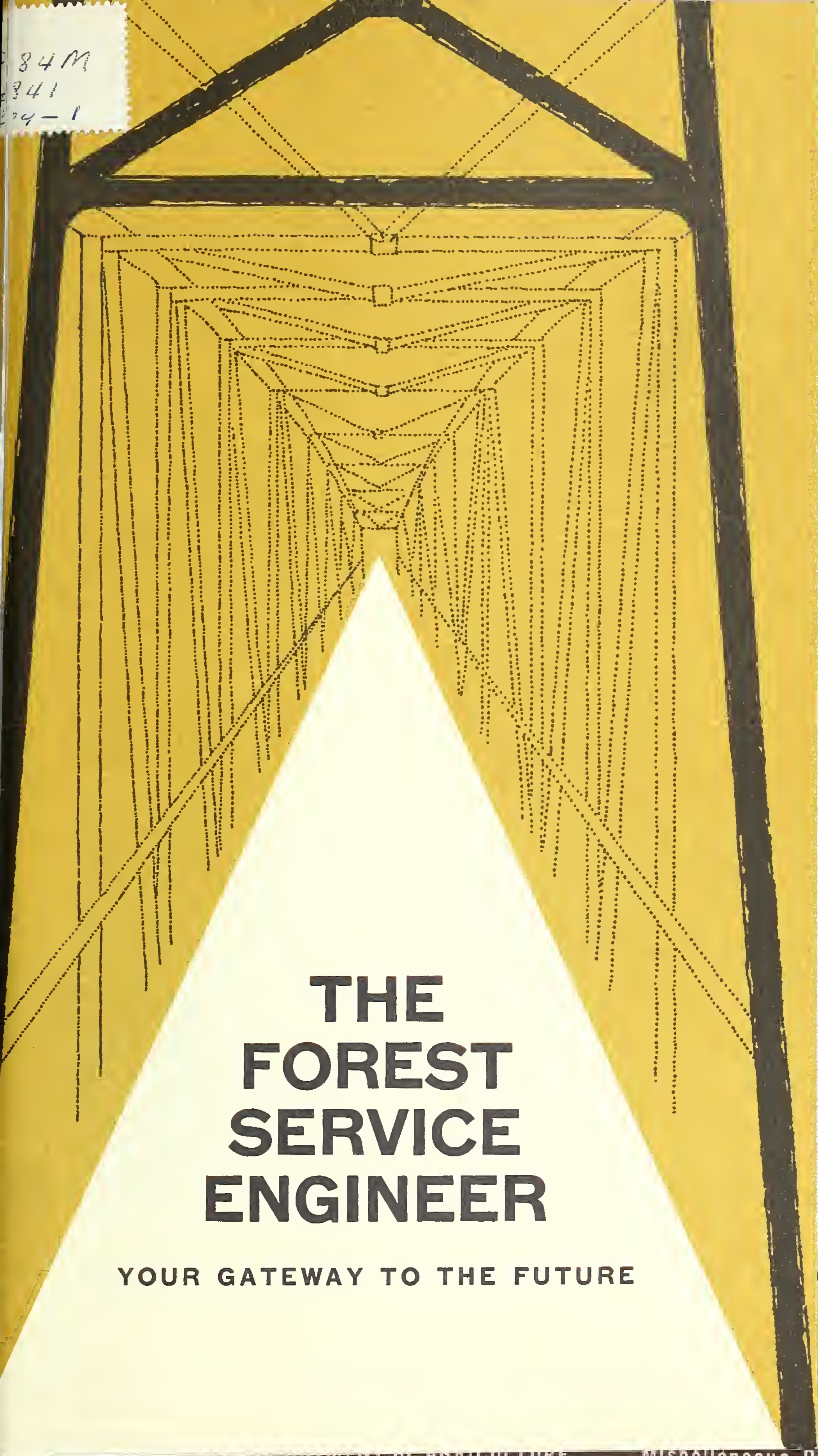

THE FOREST SERVICE ENGINEER

YOUR GATEWAY TO THE FUTURE

UNITED STATES DEPARTMENT OF AGRICULTURE • MISCELLANEOUS PUBLICATION NO. 841 • FOREST SERVICE

DEPARTMENT OF AGRICULTURE Miscellaneous Publication No. 842

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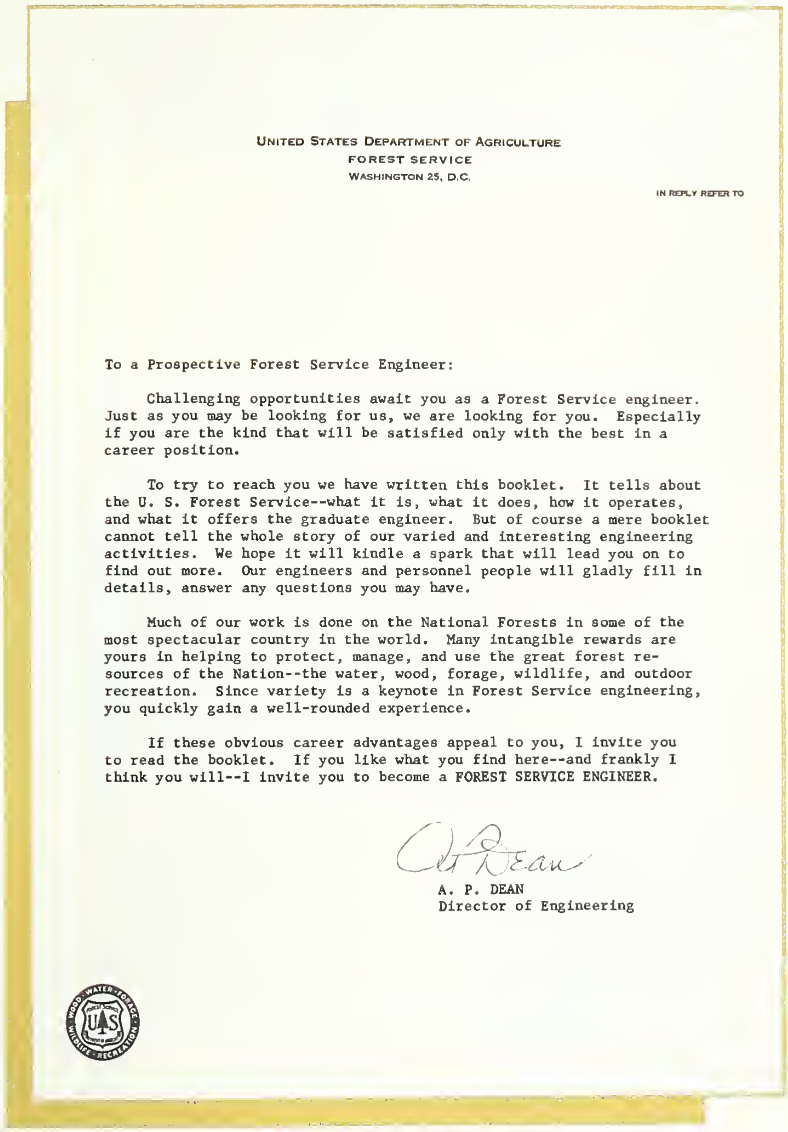

United States Department of Agriculture
FOREST SERVICE
WASHINGTON 25, D.C.

IN REPLY REFER TO

To a Prospective Forest Service Engineer:

Challenging opportunities await you as a Forest Service engineer. Just as you may be looking for us, we are looking for you. Especially if you are the kind that will be satisfied only with the best in a career position.

To try to reach you we have written this booklet. It tells about the U. S. Forest Service--what it is, what it does, how it operates, and what it offers the graduate engineer. But of course a mere booklet cannot tell the whole story of our varied and interesting engineering activities. We hope it will kindle a spark that will lead you on to find out more. Our engineers and personnel people will gladly fill in details, answer any questions you may have.

Much of our work is done on the National Forests in some of the most spectacular country in the world. Many intangible rewards are yours in helping to protect, manage, and use the great forest resources of the Nation--the water, wood, forage, wildlife, and outdoor recreation. Since variety is a keynote in Forest Service engineering, you quickly gain a well-rounded experience.

If these obvious career advantages appeal to you, I invite you to read the booklet. If you like what you find here--and frankly I think you will--I invite you to become a FOREST SERVICE ENGINEER.

A P Dean
A. P. DEAN
Director of Engineering

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THE FOREST SERVICE TODAY AND YESTERDAY

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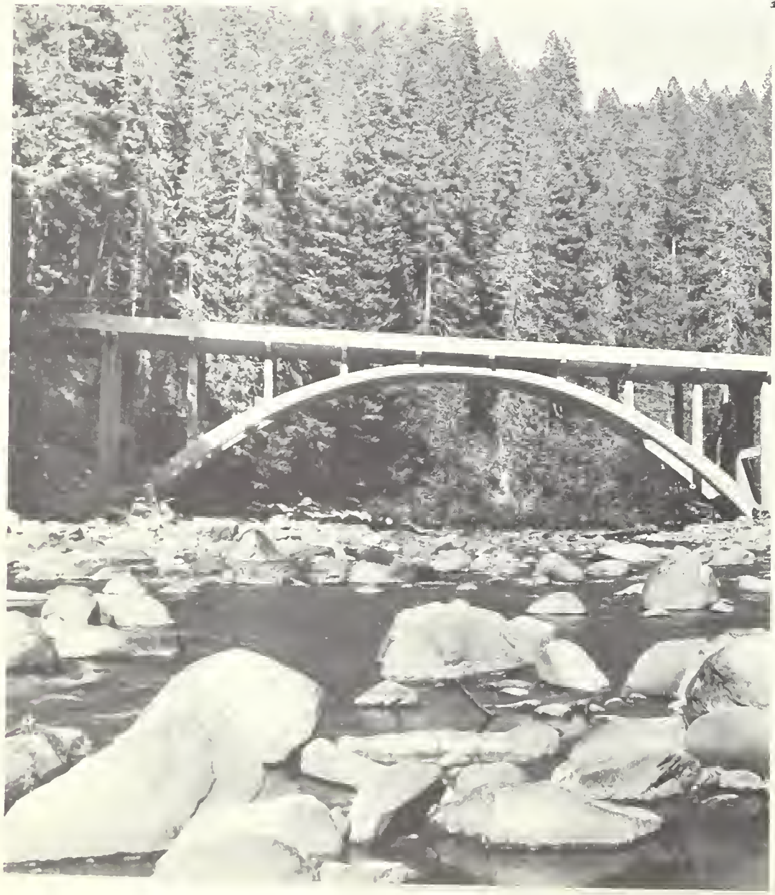

forest service people and practices
keep pace with current needs

The Forest Service— from the seedling to the tree . . .

The Forest Service was established in 1905 as an agency of the Department of Agriculture. It was assigned responsibility for a number of programs which until then had been directed by various offices of the Federal Government. At that time the organization numbered 734 employees. Its biggest job was the administration of 60 federally owned forest reserves located west of the Great Plains and aggregating 56 million acres.

Today the Forest Service employs 15,000 people in permanent full-time positions and 12,000 more in seasonal work. Major responsibilities now include administration of 154 National Forests totaling 181 million acres in area; direction of cooperative forestry programs in 50 States, Puerto Rico, and the Virgin Islands; operation of 9 regional experiment stations, 70 research centers, 5 major laboratories, and a host of smaller installations.

Even more significant than this expansion and growth is the way Forest Service techniques, practices, and standards have kept up to date. The present-day counterpart of the picturesque oldtime forest protector with his horse and buggy frequently travels by airplane and helicopter. Single-lane bridges on National Forest roads have given way to modern structures of steel and concrete. Forest fires which once occasioned hours of travel and days of manual labor are now controlled by up-to-the-minute techniques and mechanical equipment. Other examples can be cited. Application of engineering skills and procedures has had much to do with these developments.

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in the field and in the laboratory the search for better methods and better use of resources is constantly in progress

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engineering activities are chiefly associated with national-forest programs designed to protect, manage, and develop forest resources including timber, recreation, water, wildlife, and forage

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WOOD · WATER · FORAGE · WILDLIFE · RECREATION

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

cooperation with other public agencies and timberland owners in forest management and protection is the major work of the state and private forestry divisions

484411

Forest Service activities are mostly in three fields...

RESEARCH is one of these. Large numbers of people representing many sciences and skills are employed in it. Research activities in which engineers are employed include the hydrologic features of watershed management, equipment development and modification, wood technology, materials of construction, soil stabilization, cartographic procedures, forest fire behavior.

COOPERATION with other agencies concerned with land use and with the owners of timberlands is another. This cooperation is mostly related to forest management and protection. Engineering services are required in connection with equipment use and the development or maintenance of logging roads.

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NATIONAL FOREST ADMINISTRATION is the largest of the three major fields and it employs the most people, including a large number of engineers. The National Forests contain many resources of great value—timber, water, forage, recreation, fish and game—and subsurface values like coal and other minerals. All of these are available for appropriate use by people. Forest Service Engineers contribute importantly in the planning and development of physical improvements and facilitating services needed in the conservation and proper use of these resources and values. General administration of all Forest Service activities in all branches is exercised by the Chief and his staff headquartered in Washington, D.C. This central office is made up of a number of functional and operating divisions. One, headed by the Director of the Division of Engineering or Chief Engineer, is responsible for standards, policies, and practices in engineering activities. The division functions through similarly constituted branches in 10 regional offices which, in turn, exercise their responsibilities through engineers on the various National Forest units, usually directed by a Forest Engineer.

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Most Forest Service engineers work on the national forests . . .

Aside from a relatively small number of engineers stationed in the Washington and regional offices and in research units, Forest Service Engineers are employed on the 154 National Forests.

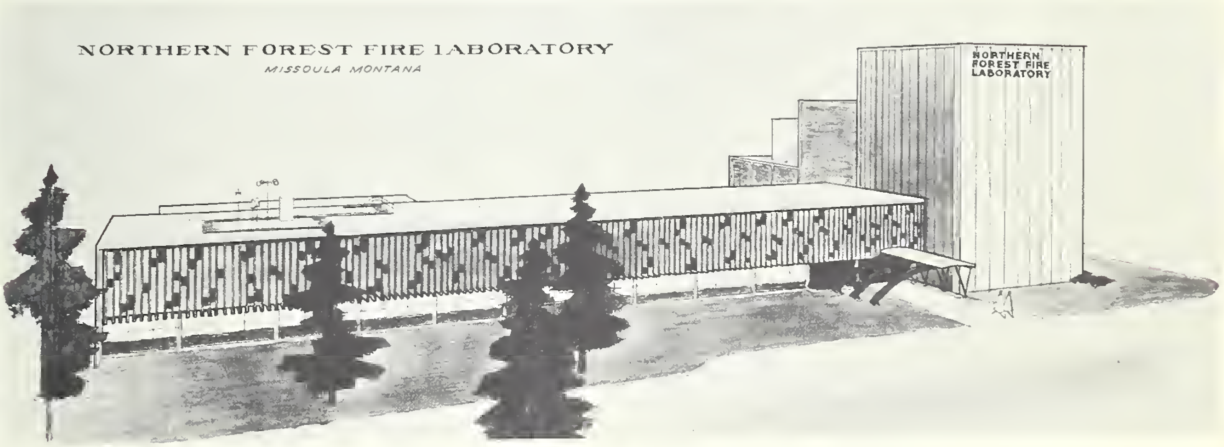
Although the majority of Forest Service Engineers are graduate civil engineers, the Forest Service employs engineers in several categories, such as—

MECHANICAL ENGINEERS: Most engineers in this category are stationed at the Forest Service equipment laboratories in Arcadia, Calif., and Missoula, Mont., or at the Forest Products Laboratory in Madison, Wis. At the equipment laboratories they work on the design, modification, and development of heavy automotive equipment and aircraft. In the field of forest products they perform basic research and investigations in the field of wood technology. A few mechanical engineers are also stationed at regional offices where they are concerned with maintenance of automotive equipment.

ELECTRONICS ENGINEERS: A few are employed in regional offices and laboratories in the design and development of communication systems. Frequently they apply their skills in emergency situations such as those that occur when people are lost in the woods or when forest fires reach major size.

HIGHWAY ENGINEERS: Those employed under this title differ but little from civil engineers and generally have the same basic education and training. The distinction is that the Highway Engineer is a specialist in the planning, design, and construction of access roads and forest highways.

BRIDGE ENGINEERS: These specialists are employed for the design and construction of the many bridges needed in the forest road system.


NORTHERN FOREST FIRE LABORATORY
MISSOULA MONTANA
NORTHERN FOREST FIRE LABORATORY

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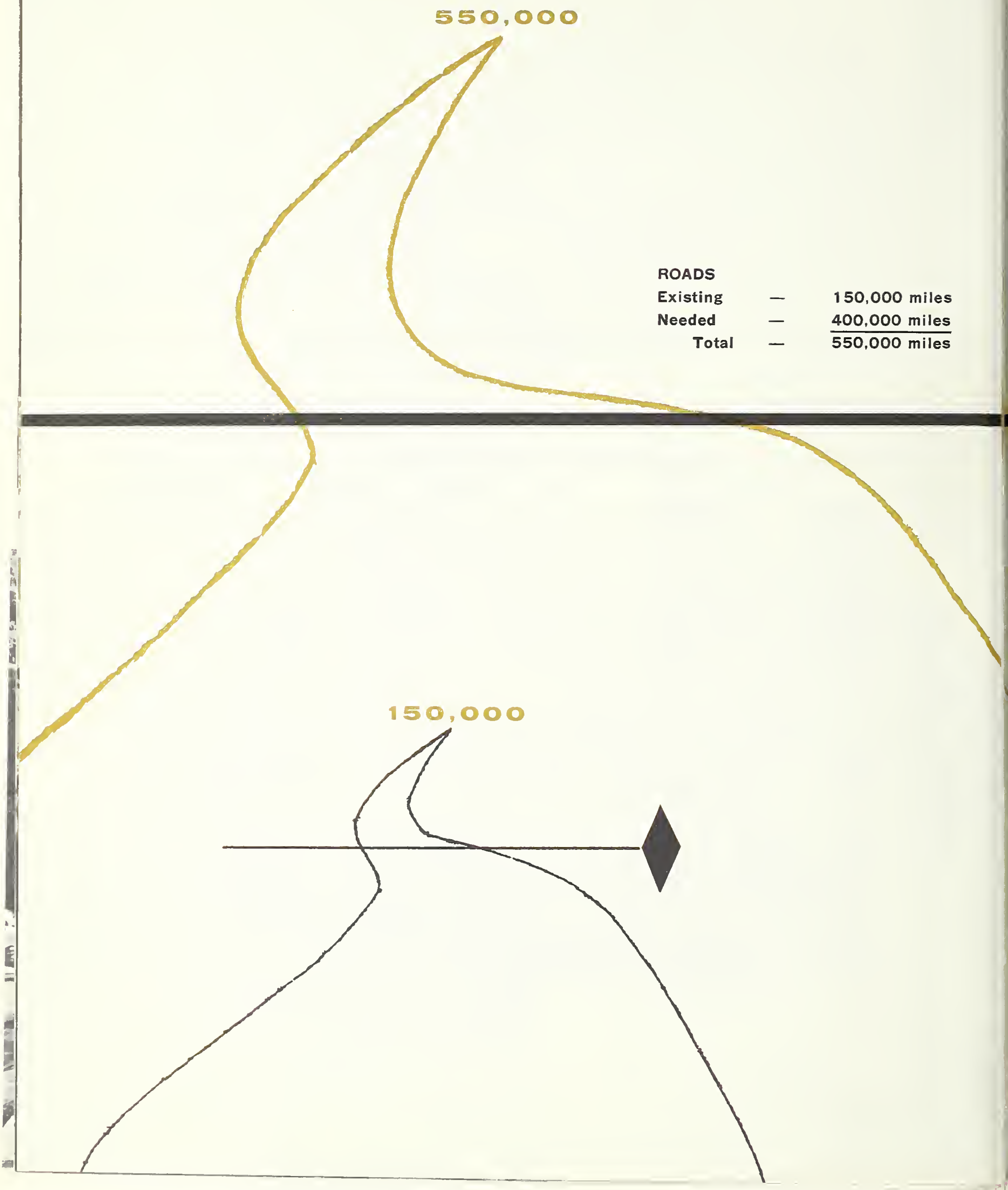

ROADS

Existing	—	150,000 miles
Needed	—	400,000 miles
Total	—	550,000 miles

CIVIL ENGINEERS: The Forest Service employs most of its engineers in this classification. They participate in the whole range of activities included in civil engineering. They design and build many types of structures.

HYDRAULIC ENGINEERS: Their work may cover, for example, watershed improvements, surface and ground water yield studies, flood control and road drainage structures, waterway design, and stream channel stabilization.

MINING ENGINEERS: Are employed to conduct mineral examinations in order to establish the validity of mining claims on the National Forests.

Civil engineering activities are numerous and varied . . .

ROADS AND BRIDGES. The forest development road system serves the National Forests. The Forest Service through its engineering staff has full responsibility for planning, designing, building, and maintaining this road network. The present system totals about 150,000 miles. Some of this mileage must be improved by construction to a higher standard before it will meet present and future needs. Also, this system must be maintained.

In addition to these existing roads, a planned system of almost 400,000 miles of new roads must be built before the National Forest lands will be sufficiently accessible to permit maximum use of all resources. At present new mileage is being constructed and added to the system at a rate of about 4,000 to 5,000 miles per year. It is expected that the rate of progress will be materially increased within the next few years.

The survey, design, and construction of this new road mileage is one of the most challenging pioneering jobs in the civil engineering field. It should have a special appeal for individuals who like nature in its primitive state.

In many instances there will be a section of mountainous terrain, much of it covered by an almost untouched forest extending for 25 miles or more without an existing road. Providing access to such an area will undoubtedly present real problems—otherwise, one or more roads would have been built previously. Here road location is much more complicated than just running a line from here to there and saying, "This is it." Often this work will require use of the most advanced techniques and procedures as well as the most capable professional engineering talent that can be made available.

Planning a new road into an undeveloped area of a National Forest begins with an examination of the topography and an evaluation of the resources to be served. This may be done by examining aerial photographs and checking any existing topographic maps. If these are inadequate, it may be necessary to make a preliminary reconnaissance of the area by foot or horseback. In

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some instances, several preliminary lines may be examined and considered. These are compared for suitability and cost. Further surveys may be made of those considered most suitable before a final decision is made.

Once the general route is established, surveys are completed along the selected line, sufficient data being taken to permit a full design of the road ready for construction. But sometimes the plans are prepared almost entirely with data from aerial photographs. In other situations, surveys are made by crews living in camps or trailers. Local conditions control the way the work is planned and accomplished, and Forest Service engineers are versatile in this respect. Variations from job to job keep the work from being monotonous.

After surveys, design, and cost estimates for a road have been completed and the job is ready for construction, the Forest Service engineer also assumes the usual resident engineer responsibility. The job is staked and construction is supervised for compliance with plans and specifications. Unanticipated conditions arising during construction are evaluated, and when appropriate, the design is modified accordingly. After the finished road is put in service, of course it must be maintained. Bridges are essential to the basic road job described above. In contrast to state highway and other normal bridge design and construction, the bridges on Forest Service roads do not permit a high degree of design standardization. Often each bridge site presents a special problem and requires individual consideration. Sometimes a concrete arch is most suitable; at other sites rigid frames, girders, trusses, or beams are used. Here again the engineering problems merit the most careful attention by highly qualified engineers, who must use initiative and ingenuity along with their professional skill in reaching the best solution.

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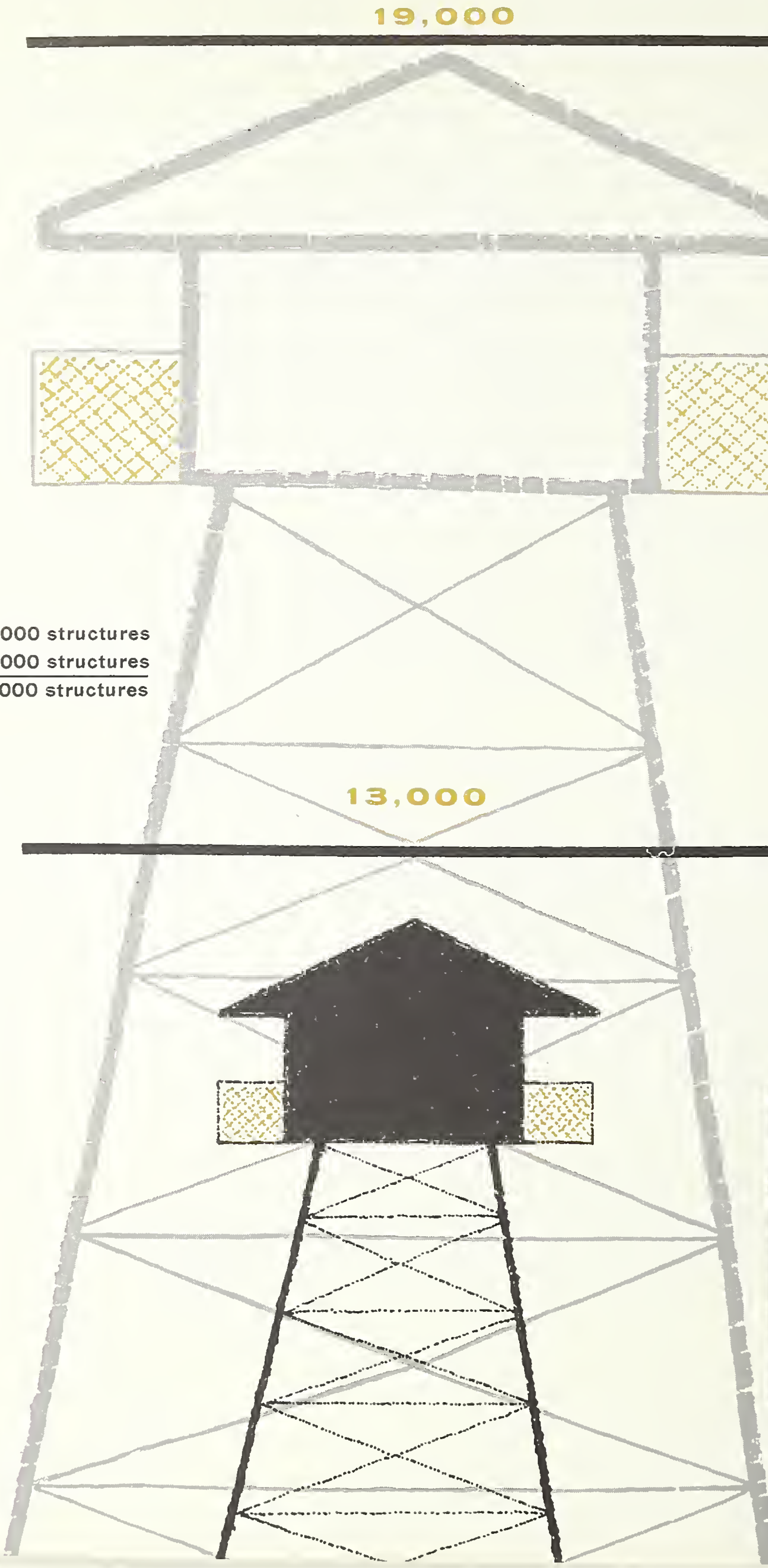

BUILDINGS
Existing — 13,000 structures
Needed — 6,000 structures
Total — 19,000 structures

STRUCTURES. Forest Service Engineers are involved in the planning, design, and construction of a variety of structures, ranging from fire lookout towers to research laboratories. They take part in the preparation of programs for construction, reconstruction, repair, and maintenance of structures. The engineer will help to determine the when, where, why, and how much, and his plans and estimates will be the basis for many important decisions. He will first assist in, and later be responsible for, the design of buildings, bridges, towers, small dams, and water control and recreation structures. As a wood-producing and marketing agency, the Forest Service encourages the use of engineered timber designs, but ample opportunity also exists for experience in design and construction of reinforced concrete and steel structures. The Forest Service Engineer will also review and approve structural designs prepared by engineers for other agencies and for individuals, wherever the interests of the National Forests may be involved.

A source of great satisfaction to any engineer is to see his design work take shape through construction. Usually the Forest Service structural engineer has this opportunity through his inspection activities. He may also serve as a resident or project engineer, and get the firsthand knowledge of construction methods that is essential to satisfactory design.

The Forest Service Engineer is encouraged to devise more economical or more useful structures, and to develop construction methods that will further the work to be done. Creative thinking is not stifled by permanent assignment to a drawing board, or by complete specialization that precludes experience in other fields. He will not design an Empire State Building or an atomic reactor, but his work will be interesting and challenging, with a good deal of individual decision and responsibility, and opportunity for personal initiative.

HYDROLOGY AND WATERSHED PROTECTION. For the civil engineer who is particularly interested in hydraulics, the Forest Service offers challenging opportunity. Water is one of the major resource protection responsibilities of the Forest Service. Some 1,500 western communities obtain their water from the National Forests; many others obtain part of their water from National

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Forest watersheds. More than 600 waterpower developments, including most of the major power projects of the West, depend on water from the National Forests. Irrigation is the largest single use of water in the West, and more than half of all western land now irrigated is either partly or wholly dependent on water from the National Forests.

Protection of this water resource calls for the specialized knowledge and skills of the hydraulic engineer, working hand-in-glove with the Forest Service land managers, in stabilizing watershed conditions to promote optimum water flows. Extensive areas of National Forest lands require intensive treatment to check erosion and surface runoff, improve infiltration capacity of the soils, and restore the land to usefulness and productivity.

Hydraulic engineers, both as research specialists and as designers of improvement works, are required in hydrologic studies of surface and ground water yields and flows, sedimentation control studies, stream channel stabilization and capacity investigations, flood routing studies, and in the evaluation and design of flood control and debris storage structures. The hydraulic engineer is also called on in the design of waterways for bridges and road drainage structures, and in checking hydraulic adequacy of water storage and transmission projects which are to occupy National Forest lands.

SANITATION. About 65 million individuals annually visit the National Forests for recreation, hunting, fishing, camping, or just plain sightseeing. In meeting this increasing demand for potable water and sanitary facilities, the Forest Service has inescapable responsibilities with regard to public health.

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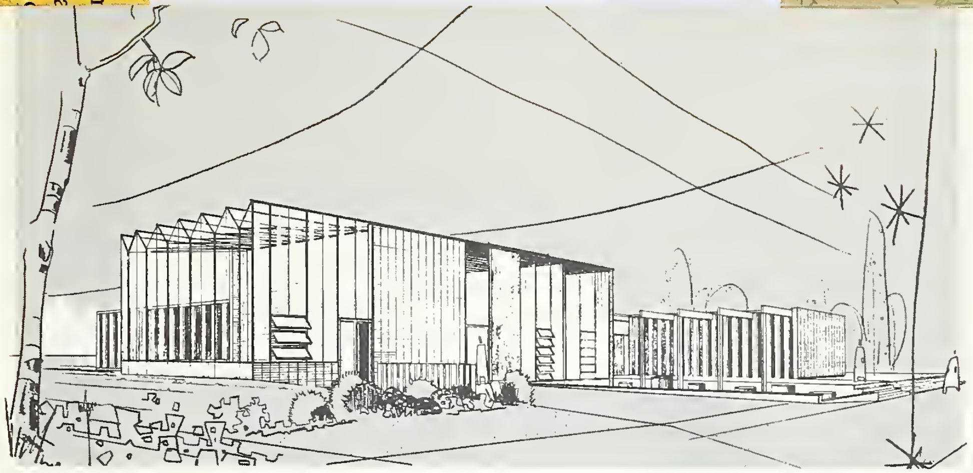

During recent years many of the existing facilities have become overtaxed. To redeem its responsibilities by providing healthful conditions, the Forest Service must properly analyze each situation; redesign and replace the obsolete, redesign and enlarge the inadequate; and design and construct any needed new facilities. The Forest Service Engineer must collect all pertinent data relating to water sources and sanitary facilities; correlate demand to quantity and capacity; develop feasible solutions; analyze comparative designs with consideration of the anticipated useful life of the improvement, maintenance costs, and initial costs; and advise on or supervise construction of the selected system.

EQUIPMENT. In its day-to-day activities the Forest Service uses an equipment fleet consisting of motor vehicles, firefighting equipment, road construction and maintenance items, besides special automotive and mechanical equipment for other uses. Included in this fleet are 630 passenger cars, 6,800 light trucks, 1,100 heavy trucks, 175 pieces of firefighting equipment, 700 tractors, 60 power shovel and loader units, 320 road maintainers, and 660 other items.

The purchase, maintenance, repair, replacement, and general management of this fleet is largely directed by mechanical and automotive engineers of the Forest Service. How this job is accomplished depends on the number of units in use within the area to be serviced.

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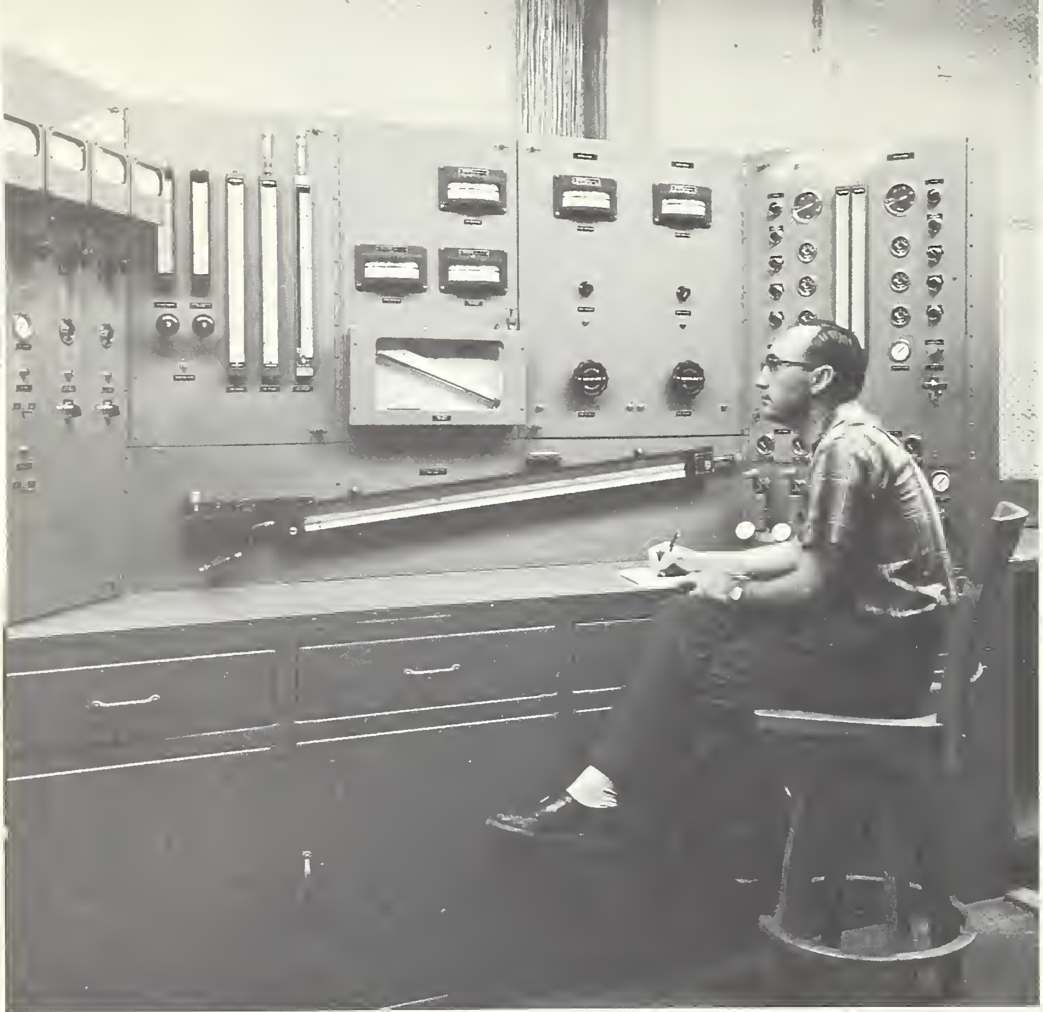

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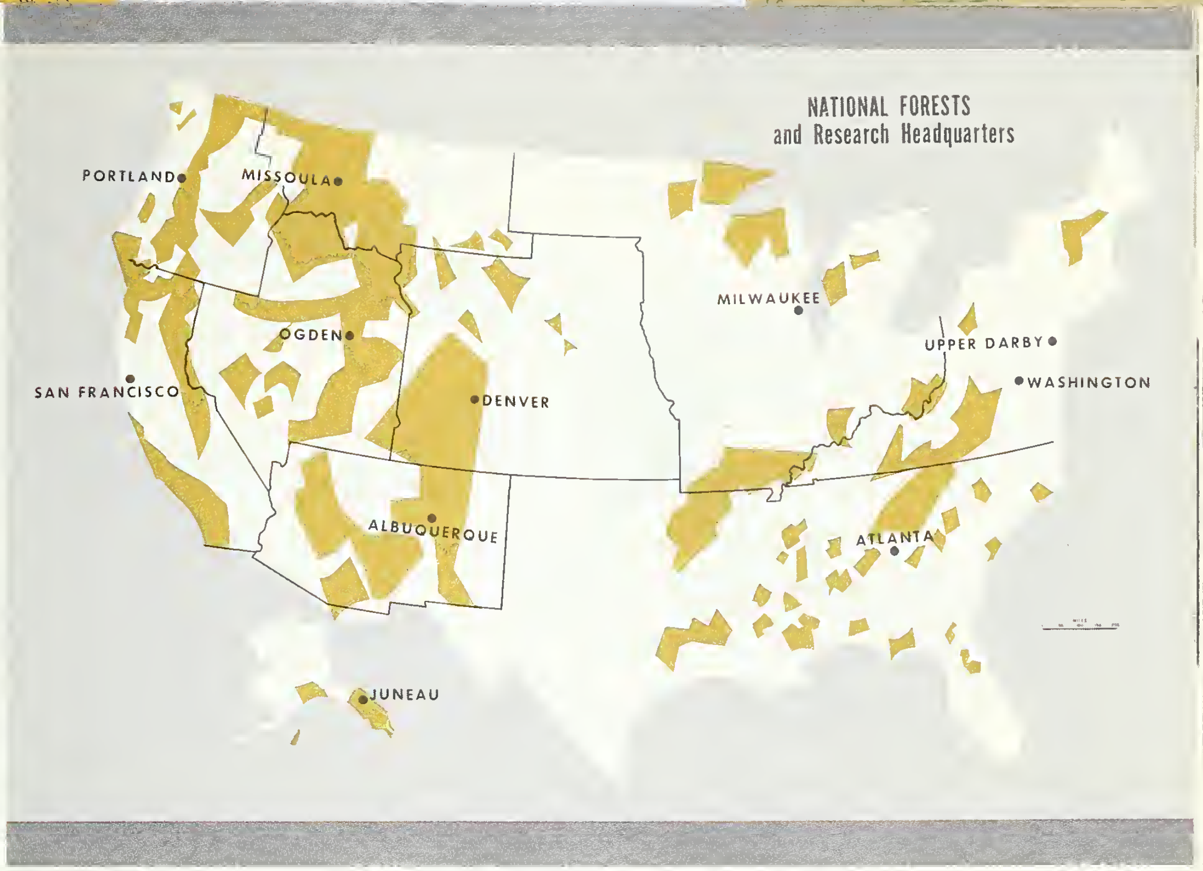

Where a large number of equipment items is concentrated in a comparatively small area, such as 4 to 6 contiguous National Forests, the Forest Service may establish equipment depots under control of the regional equipment engineer. Personnel in these depots supervise the maintenance and repair of items in use in the field and may make major repairs in the depot headquarters shop. Most of these depots operate a central shop furnished with the most modern tools and equipment. They sometimes fabricate and install special modifications or attachments. The depots also arrange for the disposal of wornout and obsolete items as well as the receipt and distribution of new equipment.

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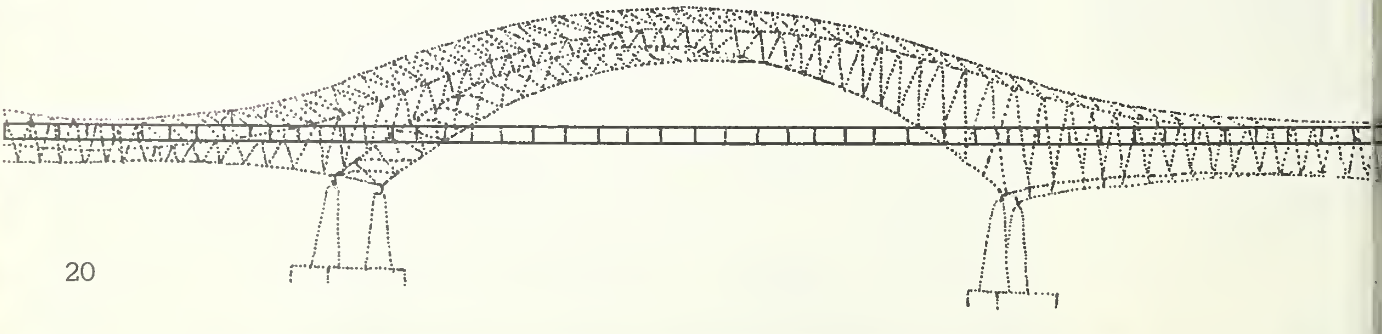
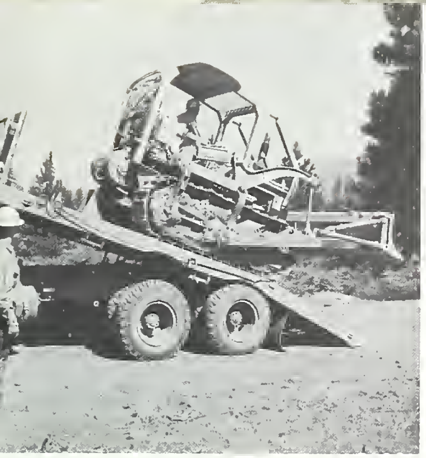
WATER AND POWER DEVELOPMENTS. One of the most important products of the National Forests is WATER. Consequently, Forest Service Engineers are called upon to work with engineers of the power and water developing companies, the Federal Power Commission, the Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service. As the more choice dam sites (readily accessible and offering easy construction) are developed and as demand increases, water and power developers are being forced into the headwaters of our great rivers and onto National Forest lands. The Forest Service Engineer works with engineers of the developer from the time a project is conceived until it is put in operation after construction. Even during operation he will consult with the developers on matters of flood routing, reservoir levels, minimum water releases for downstream water needs, and other matters of operation as they affect National Forest interests. Water and power developments usually have considerable impact on other phases of National Forest administration, protection, and development. Therefore, the Forest Service Engineer carefully checks the developer's plans, construction schedules, and operation. The purpose is to keep any adverse features at a minimum and yet permit maximum realization of the benefits from a water or power development. The Forest Service Engineer acts as an advisor and coordinator between the power developer and National Forest administrators, aiming to see that the interests of both are satisfactorily served. As the demand for water and power increases, this is fast becoming one of the most important and challenging engineering fields in the Forest Service.





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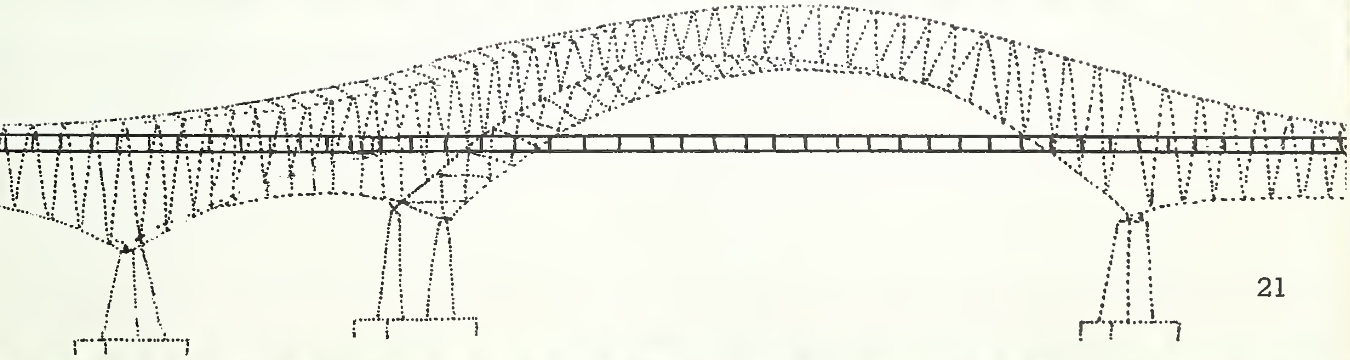

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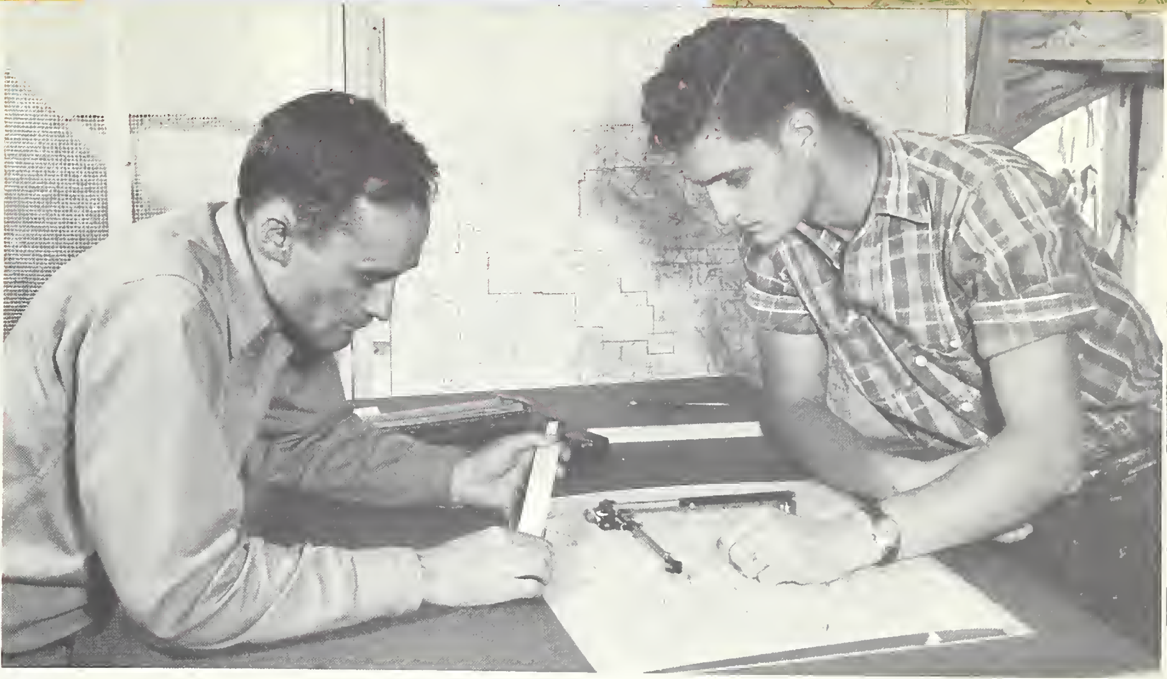

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Many National Forest jobs require the skills of engineers . . .

Initiation and subsequent performance and completion of any project is an interesting process. Basically, any work undertaken must relate to a fundamental objective of Forest Service administration. National Forest resources must be available for proper use and must be so protected, managed, and developed as to produce a maximum of benefit for the longtime good of the greatest number of people.

Application of this concept of conservation—called multiple use because it applies to all resources of forest land—requires careful planning. Every National Forest has a project work inventory. Any proposed job stemming from apparent need is studied in relation to general policy and justification. Costs are estimated, benefits are determined, alternate possibilities are studied. Approved jobs are listed in the inventory. Priorities are considered, funds are earmarked, and a job is born.

Now detailed planning begins. This includes selection of standards, calculation of needs (men, money, materials, and machinery), preparing specifications, on-the-ground surveys, inviting bids, and assignment of work crews, supervisory elements, and equipment. Work begins.

This procedure varies somewhat when projects are contracted. In that event, contracts are prepared, negotiated, and executed. In either case—force account or contract work—subsequent activity in the form of supervision and inspection is necessary.

Engineering practices and skills are needed in the performance of most forest work. Engineers frequently have the interesting and stimulating opportunity to practically live with a job from inception to completion.

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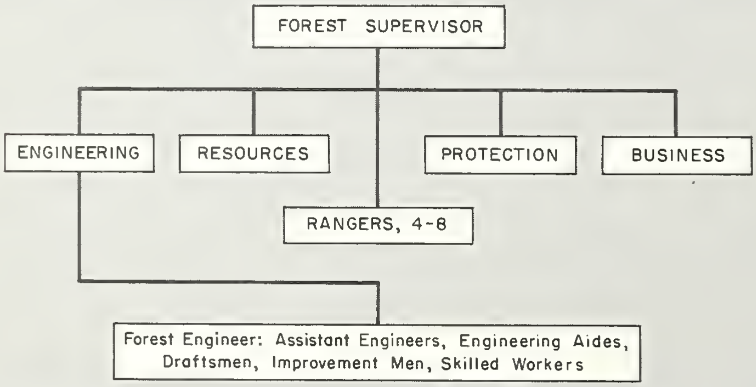
A Forest Service Engineer is first a member of a forest supervisor's staff . . .

A National Forest is administered by a Forest Supervisor who is aided by a number of staff assistants and District Rangers. Each one is responsible for a specific function or group of related activities. National Forest organizations vary somewhat with location and volume of business, but the chart which follows is illustrative of many units.

An engineer entering the Forest Service usually is assigned to the engineering unit of a National Forest and works under the direction of the forest engineer. As he gains experience and knowledge the new man advances in responsibility and grade; in due time he is promoted and placed in charge of engineering activities of a broader scope. During this period he may be assigned to a regional office for a year or two for training purposes.

After successful service as a senior National Forest engineer the individual is likely to be assigned to a responsible staff position in a regional office. He then is a definite prospect for advancement to the position of Regional Engineer. Assignment to the Washington office may follow and in time he may become Chief Engineer of the agency. Advancement is on merit.


FOREST SUPERVISOR
ENGINEERING
RESOURCES
PROTECTION
BUSINESS
RANGERS, 4-8
Forest Engineer: Assistant Engineers, Engineering Aides, Draftsmen, Improvement Men, Skilled Workers

Employment circumstances are favorable . . .

Various features of employment make association with the Forest Service particularly attractive to professional men.

TRAINING PROGRAMS are designed to help the new man orient himself to the job rapidly and to advance to more responsible positions in a minimum of time. Both on-the-job training and special group training are utilized.

OPPORTUNITY FOR ADVANCEMENT is excellent. An ever-increasing engineering workload, a merit system, and an expanding organization create a situation favorable to unusually rapid advancement.

SALARY PRACTICE makes it possible to advance beyond the entrance grade in 6 months and makes such advancement mandatory after a maximum of 2 years of satisfactory performance. Thereafter salary increases are received after each year of satisfactory service (1½ years in the higher grades).

AN INCENTIVE PROGRAM with cash awards for suggestions and exceptional performance. Employees' suggestions are solicited and appropriately recognized. Unusual accomplishments may be rewarded with a pay increase.

TRAVEL TO THE FIRST JOB for professional engineer employees is financed by the agency. This applies not only to the new employee but also to members of his immediate family and the transportation of household goods he may own. Necessary travel costs after entrance on duty are financed by the Government. Business travel is usually by Forest Service conveyance or by common carrier at Government expense.

HOLIDAY, SICKNESS, AND MILITARY LEAVE provisions are liberal and assure that salary will continue in almost any situation that personal requirements or emergency may bring about.

LIFE INSURANCE AND HEALTH BENEFIT PLANS are available to employees on an optional basis. The Government pays a substantial share of the cost.

THE 40-HOUR WEEK is standard and normally is made up of five 8-hour days. Ordered overtime is properly compensated.

RETIREMENT practices are most liberal and include provisions for dependent survivors. The Government shares with you the cost of a future annuity.

COMPENSATION FOR INJURY and job-related disability is provided.

A UNIFORM ALLOWANCE is provided for the purchase of required distinctive field clothing. Allowances for replacements are also available.

481341

the forest service engineer helps care for the nation's most valuable and most needed renewable resources.

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Your associates will represent a variety of skills and professions . . .

Forest Service employment affords an opportunity to hobnob with just about everyone from elevator boys to board chairmen.

Forest Service work is so highly complex as to require the employment of people representing a very wide variety of skills, knowledges, and professions. A list of work associates, many of them almost daily coworkers, will include accountants, airplane pilots, architects, artists, business managers, clerks, draftsmen, economists, engineers, entomologists, foresters, landscape designers, pathologists, scalers, secretaries, skilled workers of various sorts, soil scientists, wildlife managers, and even an occasional writer.

After-hours associates will, of course, be of your own choosing, but Forest Service people make friends in the communities where they live. Their kids go to school with those of the doctor, lawyer, baker, and candlestick maker. The usual array of social activity is available in almost any community in which a National Forest office is located, and generally is adequate to suit the needs of even the most gregarious kinds of people.

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CAMPGROUNDS

Existing — 51,000 family units
Needed — 102,000 family units
Total — 153,000 family units

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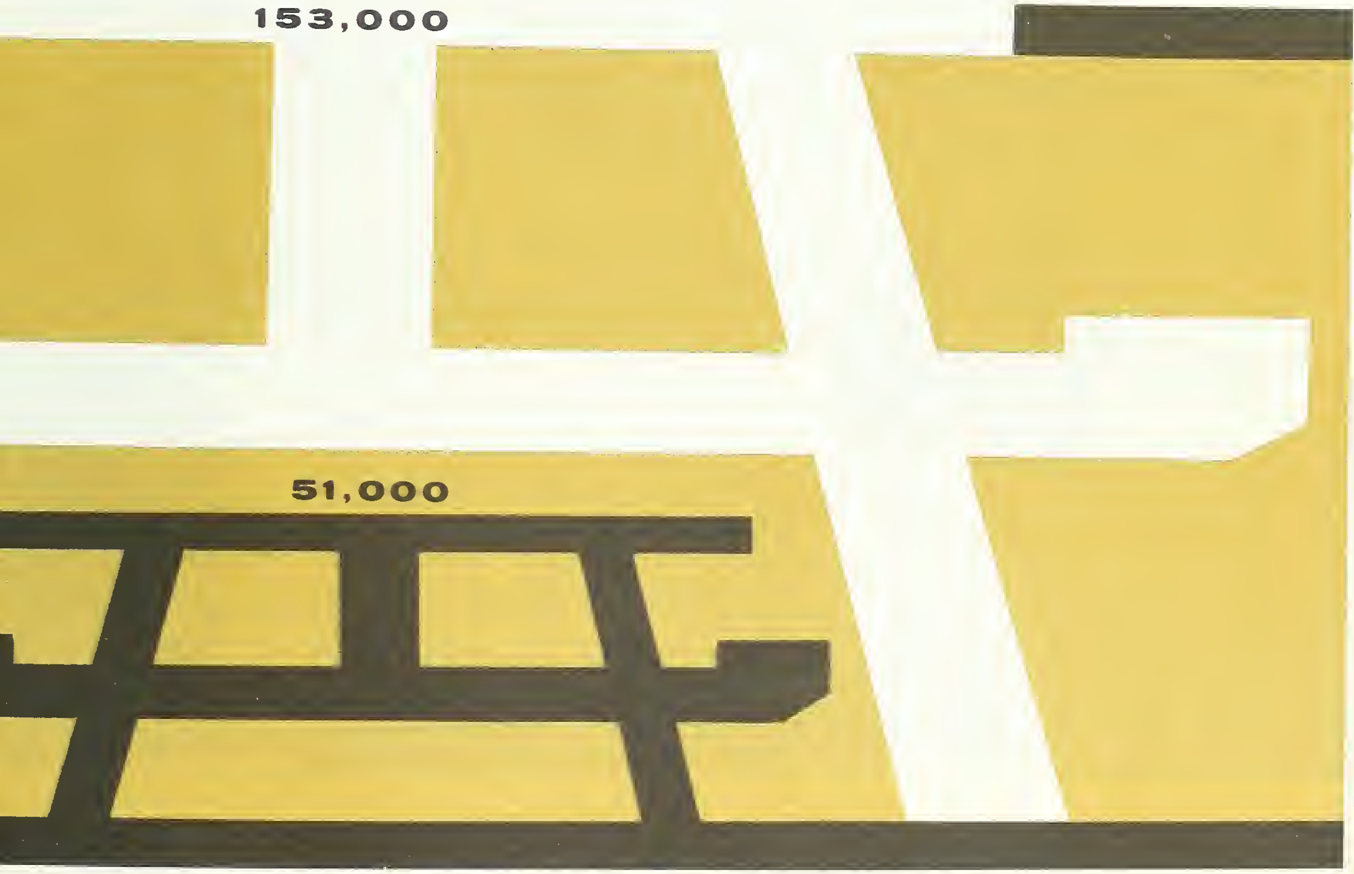

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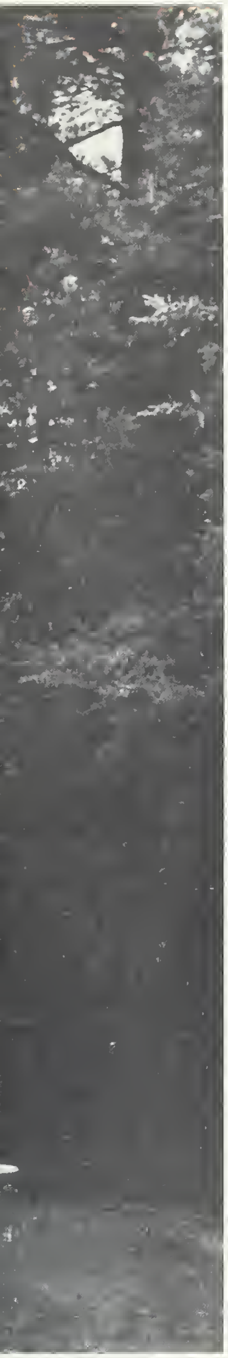

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Life in the Forest Service . . .

A few National Forest headquarters are located in large cities—Los Angeles and Seattle, for example. Some are in small hamlets and villages. However, the great majority of the units are headquartered in small cities of 10 to 20 thousand population. These are sufficiently large so that adequate and suitable housing, schools, churches, stores, shops, and other necessary facilities are available, and sufficiently small so as to avoid the trials of a big-city commuter. Travel to and from work is brief.

Men with families are not placed where facilities for family life are inadequate. In some locations the Forest Service builds residences for its people. In all cases it makes every effort to see that satisfactory living conditions are to be had where a family is located. The employee is aided in finding a home.

The Forest Service domain might by inference be thought of as a man's world, but in fact circumstances are favorable for family living. Forest Service men are family men. Like most engineers, the Forest Service Engineer must expect to do some traveling, and to spend some time away from home. The work is largely outdoor and some of it may be performed at distances which prevent returning home every evening.

Forest Service people are transferred at intervals, not for the convenience of the agency, but to develop them—to broaden their experience and help prepare them for greater responsibilities. Promotion frequently accompanies transfer. The Forest Service pays all the relocation costs for moving of the family and household goods. Funds can be advanced before the move is made.

Forest Service employment is especially attractive to those who like outdoor activities. After the fifth 8-hour day of each week they normally have ready access to the finest in outdoor sports. For urban tastes community social activities are available.

In any job a little of the bitter sometimes must be taken with the sweet. Certainly the suppression of a forest fire may entail long hours and hard, unpleasant work under trying circumstances. Emergency action in natural disasters or assisting in a search for lost people, as occasionally happens, may involve some unpleasant features. All in all, though, the work of a Forest Service Engineer and the life of his family are healthy, happy, and stimulating. Their associates are congenial people.

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What it takes to be a Forest Service Engineer . . .

An applicant must have successfully completed a curriculum approved by the Engineers Council for Professional Development. He must be an American citizen and able to pass a moderate physical examination. These are the only formalities required, but there are personal requisites for success.

Intelligence, industry, honesty, and soundness of character are important. The engineer must like the sort of life he will be called upon to lead; if he doesn't, he may find the work disagreeable. Good health and sound constitution are desirable. Administrative and executive ability are necessary in some positions. When the engineer has advanced beyond an assistantship, he has charge of men and must possess the ability to lead and direct. His advancement will depend, in large measure, on whether he is capable of more than just carrying out plans others have made. Thoroughness in detail, and the qualities of foresight and vision are important. In public programs the spirit of service is a requisite for success. It is exemplified in the policy that governs the administration of the National Forests—of so managing the forests as to promote the ". . . greatest good of the greatest number in the long run."

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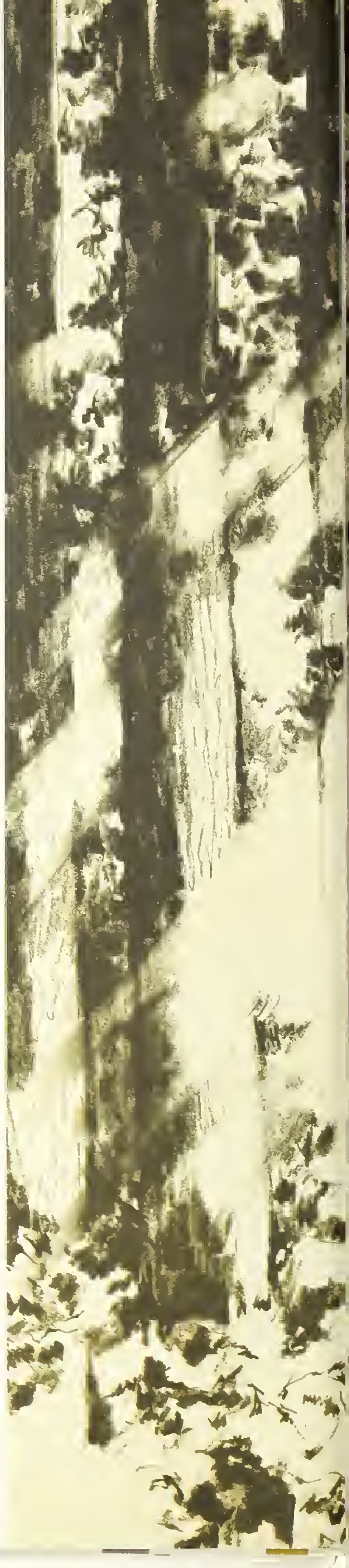

We would like to hear from you.

For more detail . . .

Address an inquiry to the Chief, U.S. Forest Service, Department of Agriculture, Washington 25, D.C., or to the Regional Forester at any of the following field addresses:

Federal Building, Missoula, Montana
Federal Center, Building 85, Denver 25, Colorado
Federal Building, 517 Gold Street S.W., Albuquerque, New Mexico
Forest Service Building, Ogden, Utah
630 Sansome Street, San Francisco 11, California
Post Office Box 4137, Portland 8, Oregon
6816 Market Street, Upper Darby, Pennsylvania
50 Seventh Street, N.E., Atlanta 23, Georgia
710 N. Sixth Street, Milwaukee 3, Wisconsin
Post Office Box 1631, Juneau, Alaska

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Growth Through Agricultural Progress

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